

ABSTRACT OF THE DISCLOSURE

A method of producing on-demand, semi-solid material for a casting process includes the steps of first heating a metal alloy until it reaches a molten state and maintaining that molten state within a desired temperature range. The next step is to ladle out a portion of the molten alloy and transfer it into a processing vessel. In one arrangement the vessel is configured with its own cooling arrangement so as to begin the solidification process for the molten alloy. In another embodiment, a thermal jacket is used to facilitate the cooling of the vessel and accordingly the cooling of the molten alloy. The next step is to apply an electromagnetic field to the molten alloy in order to create a stirring action which results in a desired flow pattern of the molten alloy within the vessel. The electromagnetic stirring begins as soon as the molten alloy is placed in the vessel and continues while the cooling continues in order to create a slurry billet of the desired metallurgical composition. The final step is to discharge the slurry billet from the vessel directly into a shot sleeve of a casting machine. The apparatus related to the described method includes a vessel which is constructed and arranged for receipt of the molten alloy. A robotic arm is provided in one embodiment for moving the vessel into a stator and then from the stator to the discharge location. In another embodiment, pneumatic cylinders are used in cooperation with structural linkages to effect movement of the vessel first into the stator and then from the stator to the discharge location. Suitable cooling arrangements for the vessel include cooling lines within the vessel, the passage of cooling air between the stator and the vessel, and the use of a thermal jacket.

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